"Observations on the minute structure of some of the higher forms of Polypi, with views of a more natural arrangement of the class." By Arthur Farre, M.B., Lecturer on Comparative Anatomy at St. Bartholomew's Hospital. Communicated by Richard Owen, Esq., F.R.S., was resumed and concluded.

After a short account of the labours of preceding naturalists in that department of zoology which comprises the various kinds of polypes, and of the different characters on which they have founded the classification of these animals, the author proceeds to the statement of his own observations on several species which had not been previously investigated with sufficient minuteness and care. Two of the species described he believes to be entirely new, and he has accordingly given them the names of *Bowerbankia densa*, and *Lagenella repens*. The other species which are the subject of the author's investigation, are *Vesicularia spinosa*, *Valkeria cuscuta*, *Alcyonidium diaphanum*, *Membranipora pilosa*, and *Notania loricalata*.

He then discusses the principles on which the classification of this tribe of zoophytes should be founded, and proposes on these principles to give the name of *Ciliobrachiata* to the whole group of polypes characterised by the possession of ciliated tentacula, and a free alimentary canal with two orifices: this group again he divides into two subordinate groups, namely, the *Hydriform* and the *Actiniform*, or *Zoanthiform* polypes. Under the title of *Nudibrachiata* he proposes to comprehend all those polypes which partake of the nature of the hydra, and whose tentacula are unprovided with cilia, corresponding to the *Anthozoa* of Ehrenberg.

"On the Temperature of Insects, and its connexion with the functions of Respiration and Circulation." By George Newport, Esq. Communicated by P. M. Roget, M.D., F.R.S.

The author states at the commencement of his paper, that, although it has been long known that insects living in society, as the bee and the ant, maintain in their habitations a temperature higher than that of the open air, the fact had never yet been established that individual insects of every kind possess a more elevated temperature than that of the medium in which they reside, and that in each species the degree of elevation varies in the different stages of their existence. He was first led to study the temperature of insects in consequence of the curious results which he had met with in some observations he had himself made, in the autumn of the year 1832, on a species of wild bee in its natural haunts, with a view to ascertain, as had been suggested to him by Dr. Marshall Hall, the relation between the temperature of these insects during their hybernation, and the irritability of their muscular fibre: but the fact of the existence of a higher temperature in individual insects had been ascertained by himself prior to these observations; the results of which observations, together with other facts connected with the physiology of insects, he subsequently communicated to Dr. M. Hall.

Since the time when the author has been engaged in the prosecution of this inquiry, some observations on the same subject have been published by Dr. Berthold, of Göttingen, who expresses it as his opinion that insects ought not to be regarded as cold-blooded animals, but who does not appear to have detected the existence of a temperature higher than the surrounding medium in any individual insect. The author also notices the observations on this subject made by Hansmann, Juch, Rengger, Dr. John Davy, and others, some of whom have detected, while others have not observed, the existence of an increased temperature in this class of animals. He then gives a detailed account of the precautions to be taken for ensuring accuracy in making observations of this kind; and remarks that greater reliance is to be placed on those made on the external than on the internal temperature of the animal, seeing that compaparative results are all that can be obtained, and that the injury inflicted on the insect by its mutilation very materially interferes with the correctness of the conclusions as to the degree of internal temperature.

After premising these introductory remarks, the author gives a detailed account of his observations on the temperature of insects in their several states of larva, pupa, and imago, from which it appears that those which possess the highest temperature are always volant insects, and are chiefly diurnal species, residing almost constantly in the open air. He shows that the larva has a lower temperature than the imago, and that the energy of its respiration is also less, regard being had to the activity of the insect, and to the size of its body. In lepidopterous insects the average elevation of temperature above that of its surrounding medium, is in the larva from $0^{\circ}.9$ to $1^{\circ}.5$; while in the imago it is from 5° to 10°. Among the hymenoptera it is from 2° to 4° in the larva, and in the imago from 4° to 15° or even 20°; but in all cases the amount of this elevation is shown to depend on the degree of activity, and the quantity of air respired during a given period. The author then inquires into the influence of various circumstances, such as inactivity, sleep, hybernation, and inordinate excitement, on the temperature of insects; and shows that the evolution of heat gradually diminishes in a degree corresponding to the length of time during which the insect remains in a state of repose, but that it is immediately increased as soon as the insect is roused into action. He adverts also to the remote cause of hybernation, which he ascribes, in every state of the insect, to accumulations of adipose matter, or of nutrient fluid, which, being stored up in the system, induce a plethoric state, from which the animal is aroused when this store of materials has been exhausted. A variety of experiments are related, tending to prove that a large proportion of the heat evolved by an insect, when in a state of great activity, is dissipated into the surrounding medium, and that the quantity of heat so generated bears definite relations to the habits, the locality, and the energy of respiration in each respective species of insect. Volant insects, he finds, have the highest temperature; and of these the diurnal bear a higher temperature than the crepuscular; next

to these must be placed the diurnal terrestrial, and last of all the nocturnal terrestrial species.

In the next division of this paper the author considers the temperature of those insects which live in societies; and in particular of the humble bee and the hive-bee. His observations are confirmatory of many of those of Huber relating to the incubating habits of the former of these species; and he has farther ascertained that during the act of incubation the bees possess a voluntary power of generating heat, whereby the temperature of their bodies is raised, apparently for the purpose of imparting warmth to the young in the cells; that this process is accompanied by accelerated respiration; and that the amount of heat evolved is proportional to the quantity of air respired. The law established by Dr. Edwards in the case of the young of mammiferous animals, namely, that they possess less power of generating heat, and that for a certain time they are unable to maintain their usual temperature, is shown by the author to be equally applicable to the early stage of insect life, and also to the perfect insect immediately after its developement from the pupa.

The temperature of the hive-bee is next examined, and it is shown, contrary to the statements of Reaumur, Huber, and others, that bees do not maintain a very high temperature in their hives during winter, but that they are disposed, when not disturbed by any occasional vicissitudes of atmospheric temperature, to assume the state of hybernation; although, on the other hand, when the bees are much disturbed, the temperature of the hive may, even in the midst of winter, become greatly raised. The temperature of the hive is lowest in January, and gradually increases up to the period of swarming, in May or June, after which time it diminishes. A table is given exhibiting the results of successive observations on the influence of the diminution of heat and of light which attended the progress of the annular eclipse of the sun on the 15th of May, 1836, on the temperature of the hive.

It appears from the inquiries of the author that different parts of the hive do not preserve the same relative heat among one another at different periods, and also that the amount of free heat in the hive is often 10° or 15°, even in the months of July and August.

The remaining division of the paper is devoted to the consideration of the connexion existing between the developement of heat and the functions of respiration, circulation, and digestion. The state of the pulse during all the different stages of the larva until its metamorphosis into the pupa is examined with great minuteness, and the results are given in a tabular form. The author traces the rate of pulsation during different conditions of repose and activity, and the corresponding frequency of respirations, and finds that although there is a general accordance between the activity of these two functions, yet that the activity of respiration and the quantity of heat evolved do not depend primarily on the velocity of the circulation, but that under all circumstances the quantity of heat developed is exactly proportional to the quantity of respiration. While the insect is feeding, and digestion is going on, the evolution of

heat increases, and while it is fasting it diminishes; but this diminution has a limit, whereas increased respiration is invariably attended by increased heat. Gaseous matter is exhaled in great abundance from the surface of the body of an insect, and contributes to regulate and equalize its temperature; but the quantity diminishes in proportion to the length of time during which it has been deprived of food. The author maintains that animal heat is not an effect of mere nervous influence, either general or ganglionic; an opinion which he derives from the following considerations: first, that in many insects in which considerable degrees of heat are evolved, and the respiration is energetic, the nervous system is small compared with that of others in which the respiration is less vigorous; and secondly, that if the evolution of animal heat were dependent on the existence of ganglia, the leech ought to generate more heat than the larva of the Lepidoptera, since it has a much greater number of ganglia. Hence he is disposed to draw the general conclusion that animal heat results directly from the changes which take place during respiration; and that the reason why so large a quantity passes off so rapidly from the body of an insect is because it does not become latent, since the circulating fluid, unlike what takes place in the higher animals, is neither completely venous nor completely arterial, but of a character intermediate between both.

Twenty-one tables are annexed exhibiting the records of the experiments referred to in the paper on the respiration, temperature, and circulation of insects.

"Observations on the Dry-rot of Ships, and an effectual method to prevent it pointed out." By James Mease, M.D. Communicated by Charles Konig, Esq., For. Sec. R.S.

The method recommended by the author for preventing the occurrence of the dry-rot in ships is to impregnate the timbers and planks with common salt, as is practised by the ship-builders in Philadelphia. For this purpose all the spaces between the timbers and the outside and inside planks are to be filled with Spanish or Portugal salt, driven down as the filling proceeds. The salt is found to penetrate thoroughly, and completely to saturate the wood, combining with its native sap and preventing fermentation and the consequent evolution of foul air. The principal inconvenience attending this method is the dampness of the ships; an evil for which the author suggests various remedies.

"Experimental Researches on the conducting powers of wires for Electricity; and on the heat developed in metallic and liquid conductors." By the Rev. William Ritchie, L.L.D., Professor of Natural Philosophy in the Royal Institution of Great Britain, and of Natural Philosophy and Astronomy in University College, London.

In a former communication, published in the Philosophical Transactions for 1833, the author endeavoured to show that the quantity of voltaic electricity conducted, or the force of the current, was a function of a greater number of variables than had been previously